An axial-flow turbine

Description of **GB1027843**

PATENT SPECIFICXTION

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Index at acceptance:-FI T(B2C, B2R) Int. Cl.:-F 01 b COMPLETE SPECIFICATION

An Axial-Flow Turbine We, LICENTIA PATENT-VERWALTUNGSG.M.B.H., of 1 Theodor-Stern-Kai, Frankfurt am Main, West Germany, a German Body Corporate, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: -

This invention relates to axial flow turbines of the kind comprising an inner housing surrounded by an outer housing, one of which has an annular flange which engages an annular radial surface on the other. Such flanges are provided to form partitions to divide the space between the outer turbine casing and the inner turbine casing into compartments in which different pressures exist.

The invention consists in that in a turbine of the kind mentioned, the said flange has radial slots distributed therearound, each slot being sealed over its radial length by a resilient sealing element.

The presence of these slots reduces, or even prevents completely, undulating distortions to which the flange is subject due to the heat.

These distortions are in the form of small deflections of the flange in both axial directions, and can not be tolerated when, as here, the spaces either side of the flange are to be sealed from one another against flow of pressure medium in the axial direction. Thus the provision of the radial slots ensures that the flange lies closely against the annular radial surface around the full circumference. And in order to seal the passages which are formed by the slots, a sealing element is provided in each slit which element extends over the radial length of the slot, and the sealing elements are made resilient so as to not detract from the beneficial effect afforded by the slots.

In order that the invention may be clearly understood, it will now be described by way of example with reference to the accompanying drawings, wherein EPrice 4s. 6d.] Figure 1 shows a view, seen in the direction of the arrow A in Figure 2, of a part of the inner casing of an axial-flow gas turbine.

Figure 2 shows a section along the line I-I in Figure 11, 50 Figure 3 shows on an enlarged scale a section along the line II-II in Figure 1, Figure 4 represents a cross section of the sealing element taken along line III-III in Figure 3, and 55 Figure 5 is a section along the line V-V in Figure 2 and shows a modified construction of the sealing element.

Figure 1 and 2 show a part 11 of the inner casing of the axial-flow turbine which part is 60 divided along an axial plane 10 and may form a stationary-blade carrier. The part 11 has an integral flange which projects into an annular groove of the outer turbine casing 13.

The flange 12 thus divides the annular space 65 between the inner and outer turbine casing into a

compartment 14 and into a compartment 15. The flange 12 may assume a mean temperature of about 6000 C. Looking at Figure 2, there is a gas at 'a higher pressure and higher temperature in the compartment 14 and a gas at a lower pressure at a lower temperature than the first in the compartment 15. The flange 12 is therefore pressed against the wall 16 of the groove. With an axial width of the annular groove of about 90 mm, the width of the gap 17 amounts to about 1/10th to 2/10th of a mm. Thus the flange 12 has axial freedom of movement within narrow limits. There is also radial spacing 18 between the bottom of the annular groove and the outer circumference of the flange 12 in order that there should be no resistance to radial heat expansion of the hot stationary-blade carrier 11 and of the hot flange 12. The flange 12 is provided with radial slots 19 which extend from the circumference of the flange radially inwards. The radially inner end of each slot 19 is widened by an axial bore 29 so as to prevent notch effects. If such slots were not provided, the flange 12 would assume the mentioned undulating shape over the whole circumference. The consequence of this would be that the flange 12 would only bear against the wall 16 of the groove at the crests of the undulations as a result of which the gas could flow through the gap 17 and the space 18 at the bottom of the groove, and then through the spaces in the region of the troughs of the undulations into the lower pressure compartment 15. This is prevented by the provision of the radial slots 19 which are distributed over the whole circumference of the flange (Figure 1). In order to prevent flow of gas through the slots 19, the latter are resiliently sealed by means of a substantially U-shaped elongated sealing and spring member 20 of metal, for example steel, spring steel, or sheet metal, as shown in Figures 3 and 4.

Now the flange 12 bears against the wall 1,6 of the groove over the whole circumference and is leakproof all over.

As can be seen from Figure 3, the member extends radially outwards from the inner end along the slot, but not right to the outer circumference of the flange 12; it bends round axially in accordance with the shape of the flange 12. The free longitudinal edges 21 and 22 of the member 120 are welded in gastight manner to the two external longitudinal edges 23 and 24 of the slot 19. The member 20 lies completely in the slot 19. As can be seen from Figure 4, the legs of the U are inclined so that the limbs 25 and 26 of the member 20 have no contact with the slot walls 27 and 28 in the cold welded-on state.

Instead of U-shaped sealing members, Vshaped sealing members could be used. Moreover, it is possible to replace these members by a longitudinally split tube 291 of a resilient material which may be arranged extending substantially radially through each slot 19 as illustrated in Figure 5.

An axial-flow turbine

Claims of **GB1027843**

WHAT WE CLAIM IS:-

1. An axial-flow turbine comprising an inner housing surrounded by an outer housing, one of which has an annular flange which engages an annular radial surface on the other, the said flange having radial slots distributed therearound, each slot being sealed over its radial length by a resilient sealing element.

2. A turbine as claimed in claim 1, wherein the said sealing element is substantially U or V-shaped in cross section.

3. A turbine as claimed in claim 2, wherein each sealing element lies within the slot it seals and wherein the edges of the limbs of the U or V-shaped sealing elements are attached to the associated sides of the slot, whilst there is no contact between the limbs of the sealing element and the opposite faces of the slot.

4. A turbine as claimed in claim 3, wherein the free edges of the limbs of each sealing element are connected to the associated radial edges of the slot in which the element is located.

5. A turbine as claimed in claim 4, wherein the said connection is effected by welding.

6. A turbine as claimed in claim 1, wherein the said sealing element is formed by a split tube extending radially within the slit.

7. An axial-flow turbine including an annular flange substantially as described with reference to and as illustrated in the accompanying drawings.

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